



DEFENSE HEALTH BOARD  
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DEC 10 2010

MEMORANDUM FOR: GEORGE PEACH TAYLOR, JR., M.D., DEPUTY ASSISTANT SECRETARY OF DEFENSE (FORCE HEALTH PROTECTION AND READINESS), PERFORMING THE DUTIES OF THE ASSISTANT SECRETARY OF DEFENSE FOR HEALTH AFFAIRS

SUBJECT: Recommendations Regarding the Tactical Combat Casualty Care Guidelines on Fluid Resuscitation 2010-07

## BACKGROUND

1. Tactical Combat Casualty Care (TCCC) is a set of trauma management guidelines customized for use on the battlefield. The TCCC Guidelines, originally developed for Special Operations Forces in 1996, are now used by all Services within the Department of Defense. The guidelines are reviewed quarterly by the Committee on TCCC (CoTCCC) to ensure that they represent current best practices for battlefield trauma care.
2. The CoTCCC review of the TCCC Guidelines incorporates both current evidence and expert opinion. The TCCC Guidelines are published in the Prehospital Trauma Life Support (PHTLS) Manual; the trauma care recommendations in the PHTLS Manual are endorsed by the American College of Surgeons Committee on Trauma and the National Association of Emergency Medical Technicians.
3. On August 3, 2010, the CoTCCC recommended proposed revisions to the TCCC Guidelines on fluid resuscitation in Tactical Field Care and Tactical Evacuation Care. The proposed changes were presented to the Trauma and Injury Subcommittee and unanimously approved on August 4, 2010. The recommendations were deliberated and unanimously approved in open session at the Defense Health Board (DHB) meeting on November 1, 2010.

## INTRODUCTION

4. Despite the widespread use of pre-hospital fluid resuscitation with crystalloid fluids, the benefit to trauma patients has not yet been established in the literature. Previous strategies calling for large-volume resuscitation with crystalloids were based primarily on animal studies using controlled hemorrhage models.
  - a. Available human data indicated that aggressive fluid resuscitation in the setting of uncontrolled hemorrhage is either of no benefit or results in an increase in blood loss and/or an increase in mortality when compared to no fluid resuscitation or hypotensive resuscitation.
  - b. Crystalloid fluids were noted to leave the intravascular space rapidly, presenting a problem for military casualties in whom evacuation may be prolonged.

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5. The original TCCC Guidelines accordingly called for fluids to be withheld in uncontrolled hemorrhage and for resuscitation to be performed with longer-acting colloids in casualties with shock from controlled hemorrhage.
6. In December 1999, the U.S. Special Operations Command sponsored a conference to discuss the tactical medicine lessons learned in the Battle of Mogadishu. There was a clear consensus among the expert panel members participating in this review that when a casualty displays mental status changes due to shock, he or she must be fluid resuscitated. Furthermore, the panel emphasized the importance of not aggressively administering intravenous (IV) fluids with the goal of achieving a normal blood pressure in casualties with penetrating injuries of the chest or abdomen because of concerns about interference with the body's efforts to achieve hemostasis.
7. The U.S. Army Medical Research and Material Command sponsored a series of meetings in 2001 and 2002 to review the state of the art of fluid resuscitation in combat casualties. Subject matter experts (SMEs) deliberated and concluded that altered mental states and weak or absent radial pulse are the best field indicators of shock.
  - a. If the casualty is in shock, the medic is to administer an initial bolus of 500 mL of Hextend; if there is unsatisfactory clinical improvement after 30 minutes, a second 500 mL bolus of Hextend is given.
  - b. On January 8 and 9, 2010, the U.S. Army Institute of Surgical Research hosted another focused review of this topic that included over 100 SMEs from around the country. They concluded that no changes to the current hypotensive resuscitation with Hextend strategy were indicated at this time. The SMEs also encouraged the continuation of freeze-dried plasma studies.

## FINDINGS

8. Following a review of current best practices on fluid resuscitation in the tactical evacuation setting, the CoTCCC noted several perceived deficiencies in the previous TCCC Guidelines. Among those deficiencies were:
  - a. Recommending the use of Hextend instead of blood products when both are available in Tactical Evacuation Care (TACEVAC);
  - b. Not reflecting the current theater trauma practice of administering packed red blood cells (PRBCs) and thawed plasma in a 1:1 ratio when blood products are available during TACEVAC;
  - c. Not including a provision for the use of blood pressure measurements to guide fluid resuscitation during TACEVAC, at which point electronic measurement of blood pressure should be available;



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- d. Need for modifying fluid resuscitation strategies to base decisions on fluid resuscitation in casualties with traumatic brain injury (TBI) on pulse character or measured blood pressure, not mental status.

CONCLUSIONS

9. The Board recognizes the importance of providing optimal resuscitation to combat casualties with hemorrhagic shock. The Board approves and endorses the following changes to the TCCC Guidelines on fluid resuscitation and recommends that the Department endorse the following changes to the TCCC Guidelines to the Services.

RECOMMENDATIONS

10. Based on recent literature and expert opinion on fluid resuscitation in battlefield trauma care, the Board advises the Department that the changes to the TCCC Guidelines noted below should be incorporated into the TCCC Guidelines and forwarded to the Services for use in their battlefield trauma care training programs (proposed changes are ***bolded and italicized***):

a. Tactical Field Care

6. Fluid Resuscitation: Assess for hemorrhagic shock; altered mental status (in the absence of head injury) and weak or absent peripheral pulses are the best field indicators of shock.
  - (a) If not in shock:
    - (i) No IV fluids necessary
    - (ii) PO fluids permissible if conscious and can swallow
  - (b) If in shock:
    - (i) Hextend, 500 mL IV bolus
    - (ii) Repeat once after 30 minutes if still in shock
    - (iii) No more than 1000 mL of Hextend
  - (c) Continued efforts to resuscitate must be weighed against logistical and tactical considerations and the risk of incurring further casualties.
  - (d) If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse, resuscitate as necessary to maintain a palpable radial pulse.***

b. Tactical Evacuation Care

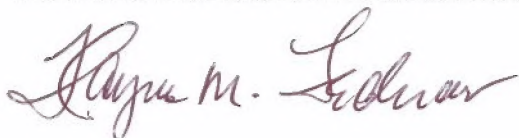
5. Fluid Resuscitation: Reassess for hemorrhagic shock (altered mental status in the absence of brain injury and/or change in pulse character). ***If blood pressure (BP) monitoring is available, maintain target systolic BP 80-90 mmHg.***

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- (a) If not in shock:
  - (i) No IV fluids necessary
  - (ii) PO fluids permissible if conscious and can swallow
- (b) ***If in shock and blood products are not available:***
  - (i) Hextend 500-mL IV bolus
  - (ii) Repeat after 30 minutes if still in shock
  - (iii) ***Continue resuscitation with Hextend or crystalloid solution as needed to maintain target BP or clinical improvement***
- (c) ***If in shock and blood products are available under an approved command or theater protocol:***
  - (i) ***Resuscitate with two units of plasma followed by packed red blood cells (PRBCs) in a 1:1 ratio. If blood component therapy is not available, transfuse fresh whole blood. Continue resuscitation as needed to maintain target BP or clinical improvement***
- (d) ***If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse, resuscitate as necessary to maintain a palpable radial pulse. If BP monitoring is available, maintain target systolic BP of at least 90 mmHg***

11. The above recommendations were unanimously approved.

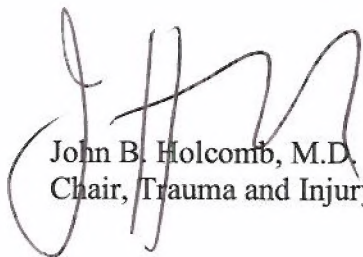
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Frank K. Butler, M.D.  
Chair, Committee on Tactical  
Combat Casualty Care

REFERENCES:

- a. Presentation, Trauma and Injury Subcommittee Update: Tactical Combat Casualty Care Guidelines: Fluid Resuscitation in Tactical Field Care and Tactical Evacuation Care, to the



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Defense Health Board, November 1, 2010, by CAPT Jeffrey W. Timby, DHB Committee on Tactical Combat Casualty Care.

- b. Presentation, Proposed Changes to the Tactical Combat Casualty Care Guidelines for Hypothermia Prevention and Fluid Resuscitation in Tactical Evacuation Care, to the Trauma and Injury Subcommittee, August 4, 2010, by CAPT Jeffrey W. Timby, DHB Committee on Tactical Combat Casualty Care.
- c. Champion HR (2003) Combat Fluid Resuscitation: Introduction and Overview of Conferences *Journal of Trauma* 54(5):S7-S12.
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- f. Butler FK, Hagmann JH, Butler EG (1996) Tactical Combat Casualty Care in Special Operations *Military Medicine* 161:(S3-S16).
- g. Bickell, WH, Wall MJ, Pepe PE, et al (1994) Immediate Versus Delayed Fluid Resuscitation for Hypotensive Patients with Penetrating Torso Injuries *New England Journal of Medicine* 331(17):1105-1109.
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- i. Kaweski SM, MJ Sise, et al (1990) The Effect of Prehospital Fluids on Survival in Trauma Patients *Journal of Trauma* 30(10):1215-1218.